Spring 6-13-2014

Wastewater reuse in Apulia: constraints and perspectives

Vito Colucci
Apulia Hydric Authority

Wastewater reuse in Apulia: constraints and perspectives

Apulia Hydric Authority
Ing. Vito Colucci – General Manager

June 8-14, 2014
Otranto (Lecce), ITALY

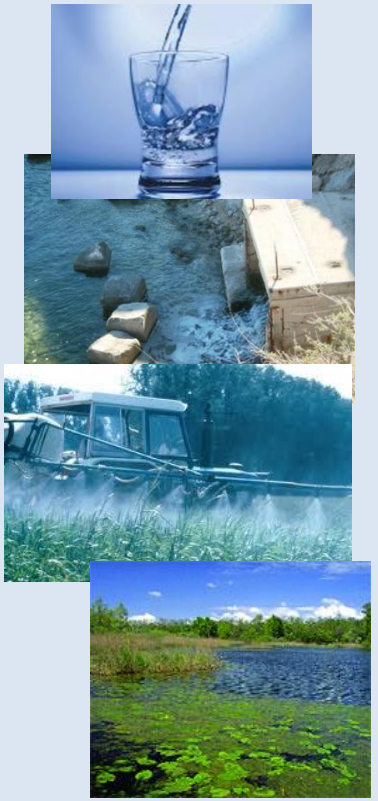
Table of contents

- REFINEMENT PLANTS – Generality
- REGULATORY FRAMEWORK
- REGIONAL PLANNING ADDRESSES
- STATE OF THE ART OF REFINEMENT
- CRITICALLY
- PERSECTIVES
- ENCLOSURES (some proposals for reuse of water resources)

Recovery and reuse of urban wastewater

ADVANTAGES

- Use of water resources less valuable for compatible use;
- Recovery of water resources valuable for drinking water;
- Benefits arising from the “non discharge” with a consequent reduction of the environmental impact on the final receptors (blades, land, sea);
- Beneficial effect on tourism (it avoids discharge to the sea in summer);
- Reduction in the use of chemical fertilizers in agriculture production (through the distribution of macro nutrients on the land);
- Re-appropriation of the territory through the recovery of areas with a significant environmental value (Blades, wetlands….);
- Reactivation of the natural processes of self purification and indirect groundwater recharge.



Normative References

National regulatory framework

- Directive 91/271 CEE
- Law of the 5th of January 1994,No.36
- Legislative decree 152/2006
- M.D. 185/2003

Regional actions to promote the activation of reuse in Puglia

- Regional law n.27/2008
- Deliberation of the Regional council May the 23rd No.2637 ,2010
- Regional Regulation No.8/2012

Other regional actions in the field of reuse

- Ground water protection project
- Deliberation of the Regional council No.2637,2010

National normative framework

Art.12 from the directory 91/271/CEE, paragraph 1

«The wastewater that has undergone treatment should be reused whenever this is appropriate. The mode of disposal should minimize the negative impact on the environment»

Art.6 from the law No.36, paragraph 2

«Regions shall establish rules and measures to promote recycling of water and reuse of treated wastewater»

Art.99 from the leg. Decree 152, paragraph 2

«Regions in accordance with the principles of state law and after consulting the supervisory authorities on water resources and waste, shall establish rules and measures to promote the recycling of water and the wastewater reuse»

M.D. 12 June 2002, No.185

«Regulation laying down technical standards for wastewater »

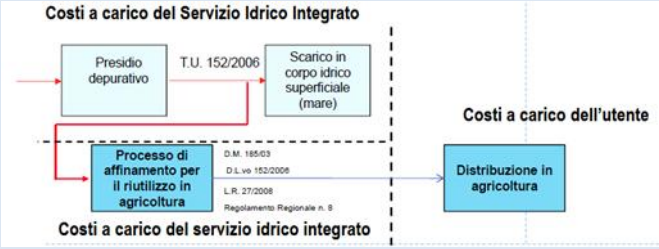
Laying enclosed the minimum quality requirements of the treated wastewater at the exit of the plant to recover

Regional normative framework

REGIONAL LAW October the 21st, No.27

"Changes and additions to the regional laws September the 6th 1999, No.28"

Inclusion in the context of refinement of the S.I.I at the expense of the rate, as a measure of intervention for achieving the quality objectives established by the regional plan for the protection of water



DELIBERATION OF THE REGIONAL COUNCIL May the 23rd No.662 ,2006

"Regulation laying down technical standards for the reuse of wastewater approved by Decree of the Ministry of Environment and Protection of Natural Resources No.185/2003"

Identification of suitable plants to dismiss water for reuse in agriculture and for which there is already an equipped district: an area intended to receive such waste;

REGIONAL REGULATION April the 18th 2012, No. 8

"Rules and measures for the reuse of treated wastewater L.D.gs. No.152/2006, art.99, paragraph 2. Law Region of Puglia No. 27 of the 21st /2008,paragraph 1, letter b)"

It defines the frame of reference for the use of water resources made available by the wastewater treatment plant, bringing a detailed description of the characteristics of the entire supply chain reuse

The recovery and reuse of urban wastewater

DESTINATIONS PERMISSIBLE USE WATEWATER RETRIEVED
Art.6 Regional Regulation n.8/2012

ENVIRONMETAL

- The use of recovered wastewater as feed water for the restoration or improvement of water balanced of wetlands and to increase the biodiversity of natural habitats;

IRRIGATION

- The use of recovered wastewater for irrigation of crops for both the production of food for human and animal consumption both non-food, as well as for irrigation of areas intended for public parks or recreation and sports;

URBAN

- The use of recovered wastewater for washing streets in urban centers;
- For the supply of heating or cooling systems;
- The feeding dual networks adduction, separate from those of drinking water, intended for washing and irrigation of green private areas to the discharge of toilets in buildings for urban use;

INDUSTRIAL

- The use of recovered wastewater as fire fighting water, process, cleaning and thermal cycling of industrial processes, with the exception of the use that involve contact between the recovered wastewater and food or pharmaceutical products and cosmetics.

Regional planning

The Water Protection Plan: saving measures and reuse as supplementary tools to be taken for the protection of water bodies and to achieve the targets environmental quality

Lists wastewater treatment plants already equipped for reuse and plants under proposals

Provincia	NOME DEPURATORE	Codice impianto	Potenzialità impianto (n° AE)	Limiti allo scarico	Volume recuperabile annuo (m^3/anno)	Q media (m^3/h)	CONSORZIO	DESTINAZIONE RIUSO	AFFINAMENTO PER RIUSO	COMPRENSORIO	INTERVENTI SUL COMPRENSORIO	VALENZA AMBIENTALE
FG	Cagnano Varano	1007100801A	10.717	Tab. 2	350.412	137	G	IRRIGUO	proposta	Cagnano Varano	esistente	Tutela area soggetta a contaminazione salina: Acquifero del Gargano Tutela Area sensibile: Lago di Varano
FG	Carapelle	1007101001A	7.000	Tab.1	154.305	59	C	IRRIGUO	proposta	Fortore	esistente	Tutela quali-quantitativa: Acquifero superficiale Tavoliere Tutela CIS: Torrente Carapelle
FG	Carpino	1007101201A	5.500	Tab. 2	147.245	56	G	IRRIGUO	proposta	non definito	proposta	Tutela area soggetta a contaminazione salina: Acquifero del Gargano
FG	Cerignola 1	1007102001A	83.200	Tab. 2	1.440.000	469	C	IRRIGUO	esistente	Sinistra Ofanto Basso	esistente	Tutela quali-quantitativa Acquifero superficialeTavoliere Tutela area sensibile: Lago Salpi
FG	Foggia 1	1007102401A	187.200	Tab.1	15.000.000	2880	C	IRRIGUO	esistente-da adeguare-	Fortore	esistente	Tutela quantitativa: Acquifero superficiale Tavoliere
FG	Lesina 1	1007102701A	14.000	Tab. 2	404.503	154	C	IRRIGUO	proposta	Fortore	esistente	Tutela quantitativa: Acquifero superficiale Tavoliere
FG	Lesina 2 Marina	1007102702A	20.000	Tab.1	106.619	41	C	IRRIGUO	proposta	Fortore	esistente	Tutela area SIC
FG	Lucera 1	1007102801A	18.750	Tab.1	collegato all'impianto di affinamento di Lucera 2							Tutela area CIS: Torrente Salsola
FG	Lucera 2	1007102801B	12.500	Tab.1	2.190.000	375	C	IRRIGUO	esistente	Fortore	esistente	Tutela area CIS: Torrente Salsola
FG	Manfredonia 1	1007102901A	77.000	Tab.1	1.941.544	739	C	IRRIGUO	proposta	Fortore	esistente	Tutela area soggetta a contaminazione salina: Acquifero del Gargano Tutela area SIC Tutela CIS: Torrente Candelaro
FG	Margherita di Savoia	1007103001A	19.800	Tab.1	540.000	125	C	IRRIGUO	esistente-da adeguare-	Margherita di Savoia	esistente	Tutela area soggetta a contaminazione salina: Acquifero del Gargano Tutela quantitativa Acquifero alluvionale Bassa valle Ofanto
FG	Monte sant'angelo 1	1007103301A	11.750	Tab. 4	358.407	136	G	IRRIGUO	proposta	Monte Sant'Angelo	proposta	Tutela area SIC Tutela area ZPS
FG	Ortanova	1007103d01A	17.740	Tab. 4	509.709	194	C	IRRIGUO	proposta	Ortanova	proposta	Tutela area soggetta a tutela quantitativa: Acquifero superficiale Tavoli

- **n° 39 plant of refinement made;**
- **n° 84 proposals for realization of refinement installations**

- **Protection of susceptible areas**
- **Protection of SIC-ZPS areas**
- **Protection of areas subject to saline contamination**
- **Protection of Significat bodies of water**

Autorità idrica pugliese

The regional planning

Forecast of recoverable volumes according to the refinement of existing systems by the PTA to the refinement of existing systems

PROVINCES	TOTAL RECUPERABLE VOLUME (m^3/year)
BARI	18 450 000
FOGGIA	24 346 000
BRINDISI	2 610 000
TARANTO	4 738 000
LECCE	8 930 000
totale	59 074 000

Estimate of the potentially recoverable volumes of water for irrigation purposes

PROVINCES	TOTAL RECUPERABLE VOLUME (m^3/year)
BARI	3 900 000
FOGGIA	0
BRINDISI	2 520 000
TARANTO	38 100 000
LECCE	3 600 000
totale	48 120 000

Estimate of the potentially recoverable volumes of water for industry

≈100 Mm^3

❖ *The activations of all plants implemented with refinement would produce a total volume of recovered water of 150 Mm^3 per year*

Regional planning

Deliberation of the Regional Council no.2637 ,2010

With reference to each of the plants of refinement by the water protection project as "***existing"*** and "***under construction"*** and it is emerged that a ***state of affairs*** which highlighted as reported in the technical report and in the summary Enclosed "A"

Elenco impianti già attrezzati per il recupero e riutilizzo dei reflui o con infrastrutture di recupero e/o riutilizzo in fase di realizzazione

ALLEGATO "A"

Provincia	IMPIANTO DI AFFINAMENTO	Trattamento depuratore	Volume recuperabile annuo (m^3/anno) - fonte PTA	DESTINAZIONE RIUSO	Stato dell'impianto di affinamento	Infrastrutture di connessione depuratore/affinamento	Infrastrutture di connessione affinamento/rete di distribuzione	COMPRENSORIO	Stato della rete di distribuzione	Gestore rete di distribuzione
BA	Acquaviva delle fonti	Terziario	666.535	IRRIGUO	Da attivare	Esistenti	Da realizzare	Adelfia-Casamassima	Attrezzata	Soc. Coop. "La Molignana"
BA	Bari est	Secondario	6.000.000	IRRIGUO	Da adeguare/rifunzionalizzare	Esistenti	Esistenti	Triggiano	Attrezzata	Consorzio di Bonifica Terre d'Apulia
BA	Bari ovest	Secondario	3.900.000	INDUSTRIALE	Da adeguare/rifunzionalizzare	Dato non disponibile	Dato non disponibile	Zona industriale di Bari	Dato non disponibile	Consorzio ASI
BA	Castellana Grotte	Terziario	250.000	IRRIGUO	Avviabile all'esercizio	Esistenti	Esistenti	Castellana	Attrezzata	Comune
BA	Conversano	Secondario	1.200.000	IRRIGUO	Da adeguare/rifunzionalizzare	Esistenti	Esistenti	Conversano	Attrezzata	Demanio Regionale
BA	Molfetta	Secondario	5.000.000	IRRIGUO	Da collaudare	Esistenti	Esistenti	Ruvo-Terlizzi-Molfetta	Attrezzata	Consorzio di Bonifica Terre d'Apulia
BA	Ruvo/Terlizzi	Terziario	Collegato all'affinamento di Molfetta	IRRIGUO	Da collaudare	Esistenti	Esistenti	Ruvo-Terlizzi-Molfetta	Attrezzata	Consorzio di Bonifica Terre d'Apulia
BAT	Andria 1	Terziario	2.600.000	IRRIGUO	Da adeguare/rifunzionalizzare	Esistenti	Da realizzare	Andria-Barletta	Attrezzata	Demanio Regionale
BAT	Barletta	Secondario	3.400.000	IRRIGUO	Da collaudare	Esistenti	Esistenti	Andria-Barletta	Attrezzata	Demanio Regionale
BAT	Margherita di Savoia	Terziario	540.000	IRRIGUO	Da adeguare/rifunzionalizzare	Esistenti	Esistenti	Margherita di Savoia	Attrezzata	Comune
BAT	San Ferdinando di Puglia	Secondario	540.000	IRRIGUO	Avviabile all'esercizio	Esistenti	Esistenti	San Ferdinando	Attrezzata	Consorzio per la Bonifica delle Capitanata
BAT	Trinitapoli	Secondario	630.000	IRRIGUO	In esercizio sperimentale	Esistenti	Esistenti	Sinistra Ofanto Basso	Attrezzata	Consorzio per la Bonifica delle Capitanata
BR	Fasano Forcatelle	Secondario	700.000	IRRIGUO	In esercizio	Esistenti	Esistenti	Fasano	Attrezzata	Comune

It reiterates:

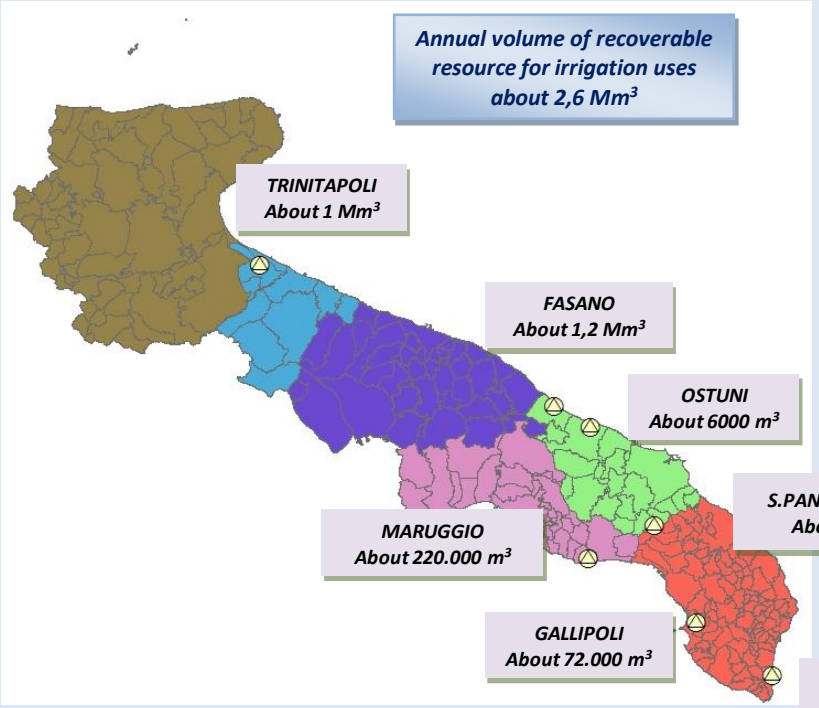
- The activation of these plants , a total of 39, is a priority for all those listed in PTA
- While the construction of "**any new plants**" is allowed upon verification of the capacity of the tariff system, subject to " **the seasoned until here no**" of the irrigation functional network existence

Autorità idrica pugliese

Refinement plants 1/2

Currently reuse is practiced only in 7 municipalities, where the plants are active aging, compared with 37 plants built.

- According to the estimates of the PTA activation of the mentioned above plants would provide a total annual volume of recoverable resource equal to **6,13 Mm³.**
- In fact, the data reported by managers, operation of these plants has provided an annual contribution in terms of volumes actually reused approximately **2,6 Mm³**

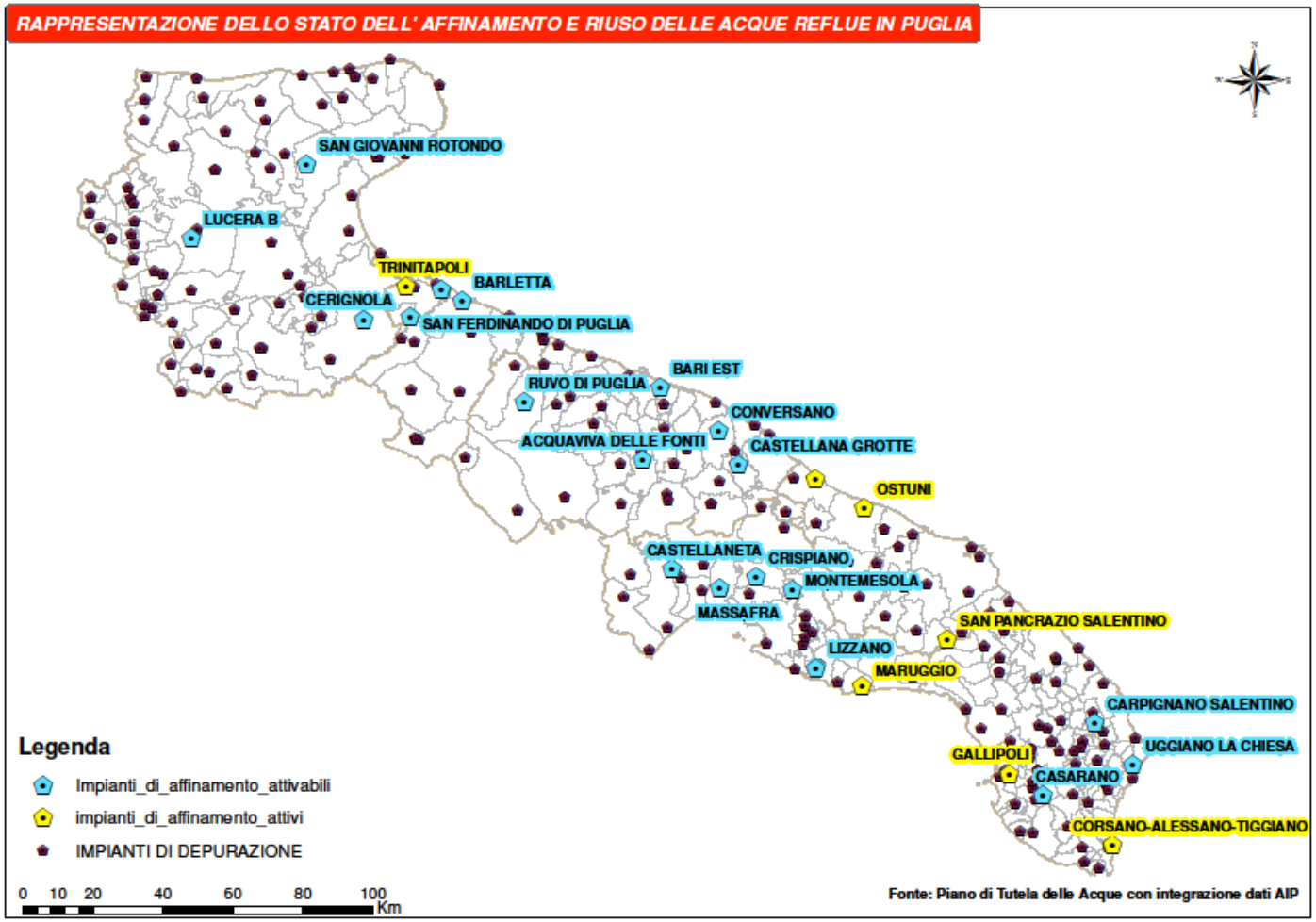


WHICH PROBLEMS?

- *Management system problem*
- *Lack of irrigation water demand*
- *Necessity of realization storage basins*

Refinement plants 2/2

- *There are propaedeutic activities for the activation of No 18 refining existing systems or adapt;*
- *To this end, we are preparing the documents of the "management plants" and "benefits-costs analysis" according to the modalities prescribed by the R.R No 8/2012;*
- *According to the estimate of the PTA , the activation of all this plants would produce a volume of about 22 Mm^3/annual*



Are in place concrete activities for the plants of Fernando of Puglia, of Castellana Caves and Barletta

Difficulty for reuse

- Analysis of costs/benefits
- To encourage incentives policies
- Verification of real demand
- Survey of irrigation networks
- Problem of exhaust
- Need of works by accumulation
- District the need of irrigation
- Use absolute or combined with conventional water

- ✓ It requires an integration with agricultural policies
- ✓ It is necessary to increase the level of knowledge of existing irrigation schemes
- ✓ **Problem of GOVERNANCE but also OPPORTUNITIES to address the issue of GOVERNANCE in the water sector**

Regional Regulation n.8/2012

Some criticalities were considered and resolved in this implementation tools

Qualitative aspect of refined waters	Requirement for quality of treated wastewater in relation to the various destination of use	**Art. 8 of R.R.** • Confirmation of compliances with the qualitative limits of which to the D.M. 185/03 • Parameters for the chemical, physical listed Table 2 of the R.R. the region of Puglia can allow the different limits waved by theM.D 185
Adjustment of distribution systems	Requirement of distribution networks and irrigation systems	**Art.11 of R.R.** • It is authorized the mixing of the treated wastewater with raw water resource ; • The mixing with a volume of raw water greater than or equal volume of recovered water involves equalization of recovered water to raw water
Problem of non –use	Alternative delivery reuse	**Art. 14 of R.R.** • For all reuse system of wastewater is provided an alternative discharge for removal of the waste uncured , in cases of partial reuse. • Alternative delivery ensures quality objectives set out in PTA
Reluctance of users to use refined water	Policies and instruments for the promotion and encouragement of reuse	**Art.3 of R.R.** • Activating actions and contributes to information and training in the proper use of the resource; • Activating financial contributions for the construction of the necessary works to reuse • Promote agreements between regions and program managers

Arrangement for the Management Plan

for resolution of others criticalities

Autorità idrica pugliese

Arrangement for the management plan

The management plan sets the frame of reference of water reuse made available by the recovery of waste water –art.5 of the Regional Regulation No. 8/2012

The management plan includes a detailed description of the characteristics of the entire chain of recovery and reuse, and in particular :

- *the individuals responsible for management and control;*
- *the characteristics of wastewater before treatment recovery;*
- *the verification of the suitability of the waste to be recovered;*
- *the localization of the recovery plan in the coordinate system WGS 1984 UTM 33N;*
- *the indication of alternative delivery reuse to be established pursuant to article in accordance with the art.14 of this regulation;*
- *the technical characteristics of refinement plan used to recovery wastewater;*
- *any point and method of mixing between the recovered wastewater and non-potable raw water resource;*
- *the information on the intended uses for recovered water;*
- *the system of supply and distribution ;*
- *the income statement for the investment and management of the recovery and reuse;*
- *the system of controls on the supply chain of recovery and import into a plan for monitoring and control prepared in accordance with the direction contained in Annex 4 of Regulation.*

Management plan

- ***The operator of the distribution network has the task of preparing a report containing the annual program resource with an indication of the monthly requirement for the irrigated season, the points of possible mixing with raw waters and the description of the distribution system***

  With this information you can check the actual water request and compare it to the potential of the plan in order to evaluate an activation module

- ***Water authority in Puglia is responsible for preparing the income statement of investment and the management of the recovered and reuse system***

  On this occasion it will be the task of the AIP to assessing the convenience of recovering of existing plan aging rather than to promote the realization of the process of aging within the treatment plan through a depth cost-benefits analysis

- ***The operator of the recovery task is to prepare a report highlighting the suitability linen direct, the amount of the flow, the characteristics of the plan, etc.***

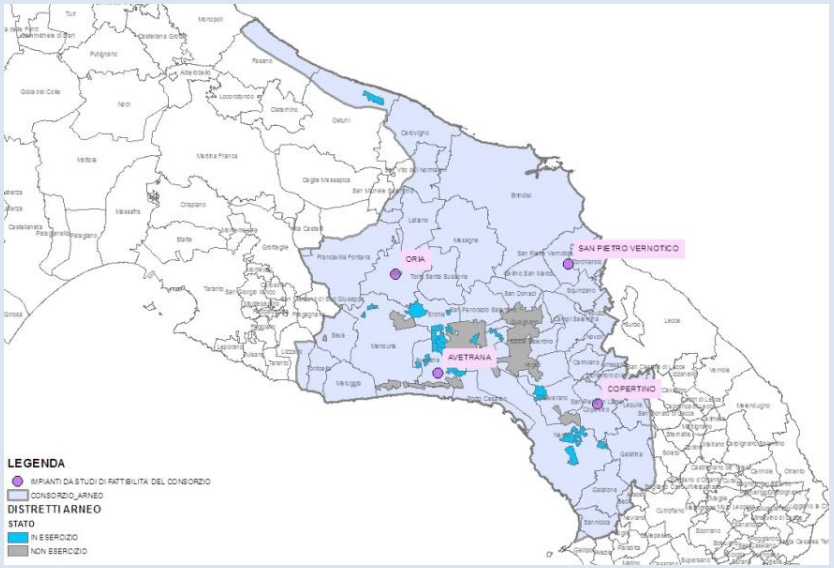
  Such communications ensure compliance of refined water to the quality standards of the law, less than occasional problems of operation of the plant

Prospettives

With the tools of management plan you can trust in overcoming the problems so far found at the end of one full exploitation of the refined resource, considering the indisputable benefits derived from its use

In this direction is the strong interest of the Consortia of Land Reclamation, motivated by different needs and experienced in the preparation of new initiatives

Consortia, whose only source of supply is groundwater, reuse of wastewater is an alternative water resource for food districts exercise as well as a valid source of supply to start operation in areas susceptible to irrigation on the basis of the review of the plan to use irrigation proposal at the planning



Enclosed here are a few suggestions for the activation of refinement plant by Consortia

An interesting initiative on the issue of water balance and plan for action on sustainable resource in Puglia:

INTERREG WAS4D project Italy-Greece

Partners: municipality of Bari, Apulia Region, Province of Brindis, AIP, university of Ioannina, NEA Greece

www.aip.gov.it

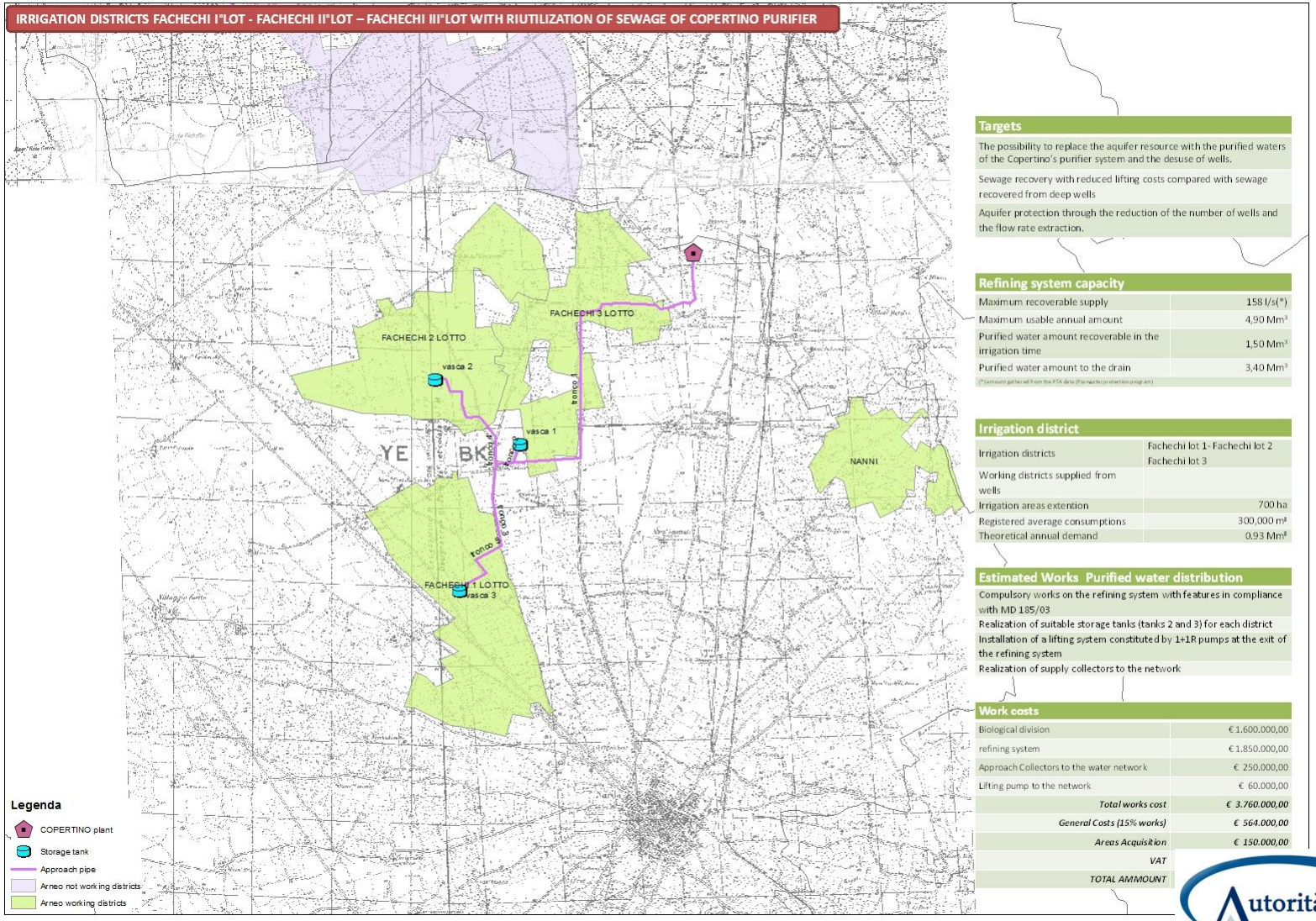
www.was4dproject.eu

Thanks for your attention

Ing. Vito Colucci

Autorità Idrica Pugliese
Via Falcone e Borsellino n. 2 Bari
www.aip.gov.it

ENCLOSURES
some proposals for reuse of water resources(*)



Targets

The possibility to replace the aquifer resource with the purified waters of the Copertino's purifier system and the desuse of wells.
Sewage recovery with reduced lifting costs compared with sewage recovered from deep wells
Aquifer protection through the reduction of the number of wells and the flow rate extraction.

Refining system capacity

Maximum recoverable supply	158 l/s(*)
Maximum usable annual amount	4,90 Mm³
Purified water amount recoverable in the irrigation time	1,50 Mm³
Purified water amount to the drain	3,40 Mm³

(*) amount gathered from the PTA data (Piano water protection program)

Irrigation district

Irrigation districts	Fachechi lot 1- Fachechi lot 2 Fachechi lot 3
Working districts supplied from wells	
Irrigation areas extention	700 ha
Registered average consumptions	300,000 m³
Theoretical annual demand	0.93 Mm³

Estimated Works Purified water distribution

Compulsory works on the refining system with features in compliance with MD 185/03
Realization of suitable storage tanks (tanks 2 and 3) for each district
Installation of a lifting system constituted by 1+1R pumps at the exit of the refining system
Realization of supply collectors to the network

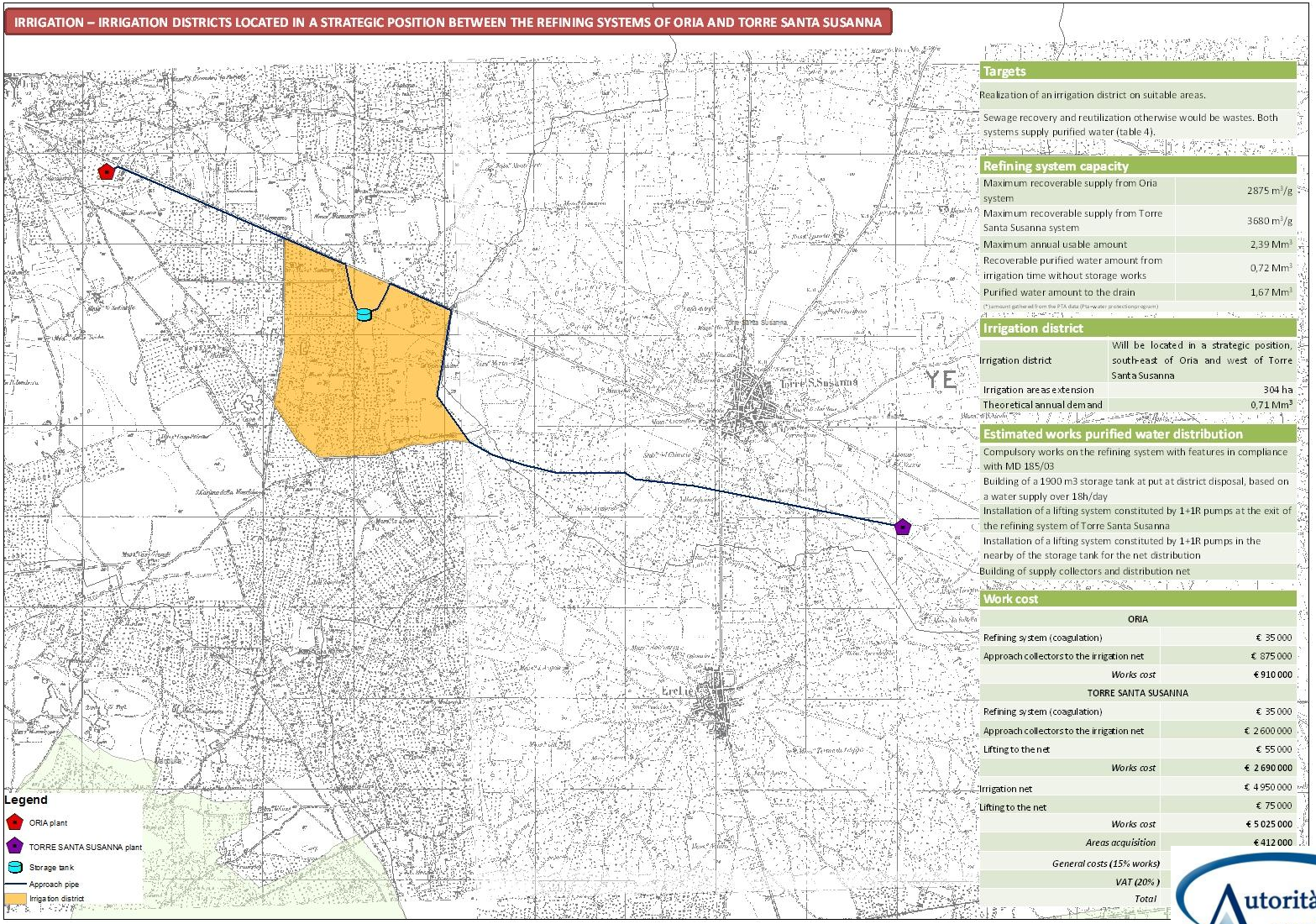
Work costs

Biological division	€ 1.600.000,00
refining system	€ 1.850.000,00
Approach Collectors to the water network	€ 250.000,00
Lifting pump to the network	€ 60.000,00
Total works cost	*€ 3.760.000,00*
General Costs (15% works)	*€ 564.000,00*
Areas Acquisition	*€ 150.000,00*
VAT	
TOTAL AMMOUNT	

(*) Source: Action Plan for the sustainable use of the resource –Interreg Was4d project– Italy -Greece

ENCLOSURES
some proposals for reuse of water resources(*)

IRRIGATION – IRRIGATION DISTRICTS LOCATED IN A STRATEGIC POSITION BETWEEN THE REFINING SYSTEMS OF ORIA AND TORRE SANTA SUSANNA



Targets

Realization of an irrigation district on suitable areas.

Sewage recovery and reutilization otherwise would be wastes. Both systems supply purified water (table 4).

Refining system capacity

Maximum recoverable supply from Oria system	2875 m^3/g
Maximum recoverable supply from Torre Santa Susanna system	3680 m^3/g
Maximum annual usable amount	2,39 Mm^3
Recoverable purified water amount from irrigation time without storage works	0,72 Mm^3
Purified water amount to the drain	1,67 Mm^3

(*) amount gathered from the PTA data (Pta=water protection program)

Irrigation district

Irrigation district	Will be located in a strategic position, south-east of Oria and west of Torre Santa Susanna
Irrigation areas extension	304 ha
Theoretical annual demand	0,71 Mm^3

Estimated works purified water distribution

Compulsory works on the refining system with features in compliance with MD 185/03

Building of a 1900 m3 storage tank at put at district disposal, based on a water supply over 18h/day

Installation of a lifting system constituted by 1+1R pumps at the exit of the refining system of Torre Santa Susanna

Installation of a lifting system constituted by 1+1R pumps in the nearby of the storage tank for the net distribution

Building of supply collectors and distribution net

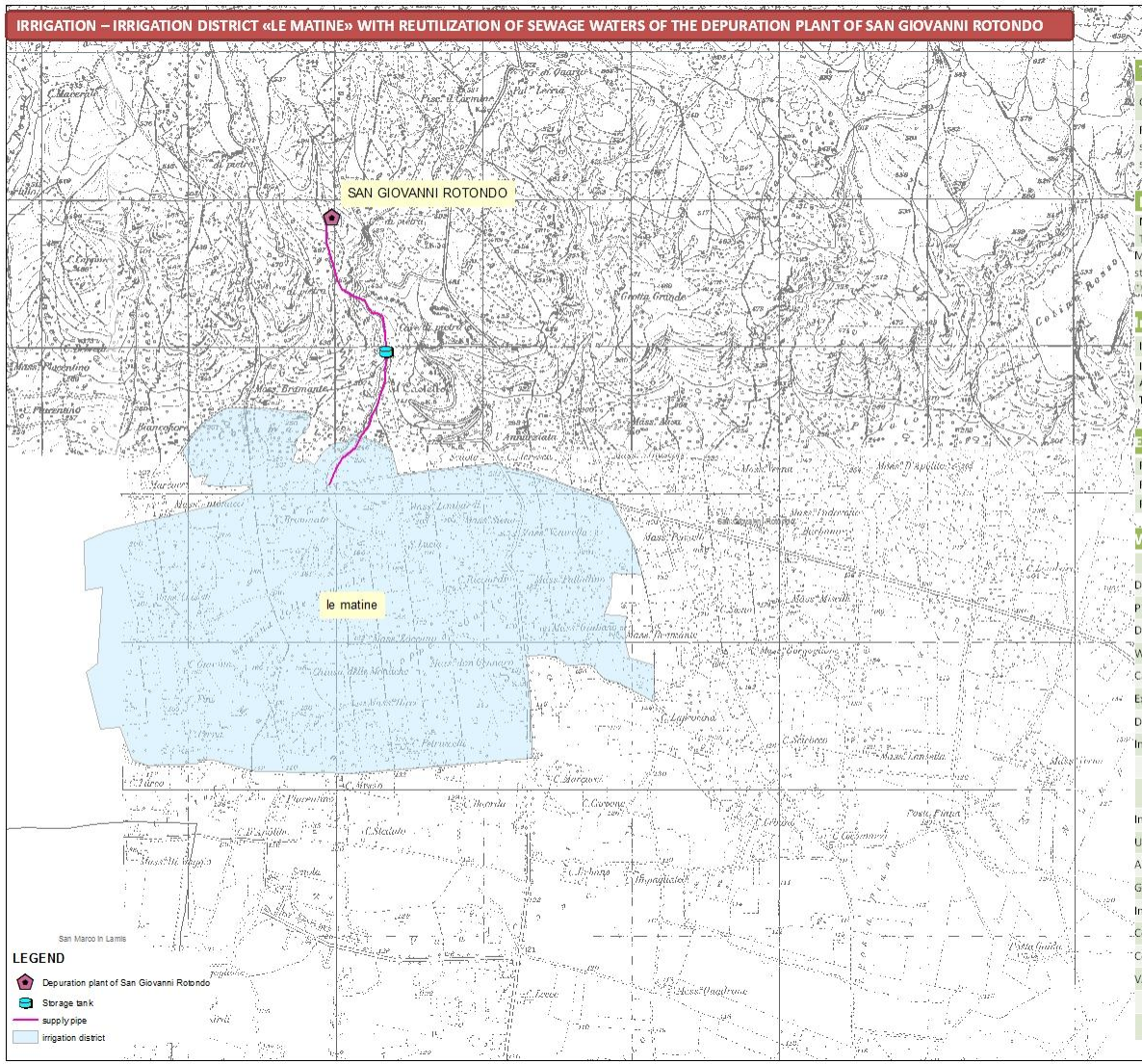
Work cost

ORIA	
Refining system (coagulation)	€ 35 000
Approach collectors to the irrigation net	€ 875 000
Works cost	€ 910 000
TORRE SANTA SUSANNA	
Refining system (coagulation)	€ 35 000
Approach collectors to the irrigation net	€ 2 600 000
Lifting to the net	€ 55 000
Works cost	€ 2 690 000
Irrigation net	€ 4 950 000
Lifting to the net	€ 75 000
Works cost	€ 5 025 000
Areas acquisition	€ 412 000
General costs (15% works)	
VAT (20%)	
Total	

(*) Source: Action Plan for the sustainable use of the resource –Interreg Was4d project– Italy -Greece

ENCLOSURES
some proposals for reuse of water resources(*)

IRRIGATION – IRRIGATION DISTRICT «LE MATINE» WITH REUTILIZATION OF SEWAGE WATERS OF THE DEPURATION PLANT OF SAN GIOVANNI ROTONDO



Targets

Create an irrigation district on irrigable areas

Recovery and reutilization of sewage that would be deposited in the surface water bodies, for the advantage of the underground water source actually overused

Refining plant capacity

Maximum recoverable amount from Trinitapoli plant	5723 m³/g
Maximum annual usable amount without storage works	0,6 Mm³

(*) amount gathered from the PTA data (Purification section 2016)

Irrigation district

Irrigation district	Irrigation areas in «Le Matine»
Irrigation district extension	687 ha
Areas extension	462 ha
Theoretical annual demand	0,9 Mm³

Estimated works purified water distribution

Realization of a storage tank of 1000 m3 connected to purifier's bayou

Realization of a water intake plant on the purifier's bayou

Realization of supply collectors and distribution network

Work costs

WORKS	
Digs	€ 542.150,09
Pipes	€ 1.404.126,11
Dams	€ 520.705,55
Waste transportation	€ 12.603,49
Catch basins and plumbing devices	€ 198.366,82
External installations and completion works	€ 160.677,12
Direct safety duties	€ 42.700,00
Indirect safety duties	€ 18.300,00
Works cost	*€ 3.506.929,18*
AVAILABLE AMMOUNTS	
Invoiced works	€ 40.000,00
Unforeseen costs	€ 52.000,00
Areas and buildings acquisition	€ 58.554,80
General costs	€ 540.822,60
Inserting duties into dump	€ 55.000,00
Costs, taxes and advertising	€ 191.800,00
Contribution public works authorities	€ 600,00
VAT	
Available total amount	
GRAND TOTAL OF THE WORK	

(*) Source: Action Plan for the sustainable use of the resource –Interreg Was4d project– Italy -Greece